

OPISTHOBRANCH MOLLUSCS FROM THE AUSTRALIAN SUB-ANTARCTIC TERRITORIES OF MACQUARIE AND HEARD ISLANDS

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ABSTRACT: Two species of opisthobranch molluscs are reported from Australian Sub-Antarctic territories. *Archidoris kerguelenensis* Bergh 1884 occurs at Macquarie Island and Heard Island. *Trinchesia maquariensis* sp. nov. is described from Macquarie Island.

INTRODUCTION

Dell's (1964) lists of marine molluscs from Macquarie and Heard Islands include no opisthobranchs. Since then, one species has been reported from Macquarie Island (Merilees & Burn 1969). Other material was found in the collections of the National Museum of Victoria (NMV in text) and some additional specimens were presented to the Museum by Miss Isobel Bennett of Sydney and Mr. R. D. Simpson of Adelaide.

SYSTEMATIC DESCRIPTIONS

Family DORIDIDAE

Archidoris Bergh 1878

Archidoris kerguelenensis Bergh 1884 (Fig. 1-7)

Archidoris kerguelenensis Bergh 1884, p. 85, Pl. 1, fig. 1-12; Merrilees & Burn 1969, p. 137.

Non *Archidoris kerguelensis* Bergh 1894, p. 159.

MATERIAL: NMV F17508, Heard Island, 4 specimens washed up on beach after storm, below camp at Atlas Cove, collected by Young and Gibbney, 16 August 1950; NMV F26579, Macquarie Island, 1 specimen from rock pool at low tide, Garden Cove, Buckles Bay, collected by W. Merilees, 16 June 1967; NMV F27408, Macquarie Island, 1 specimen from rock pool at low tide, Garden Cove, Buckles Bay, collected by Isobel Bennett, 23 March 1968.

DESCRIPTION: The larger preserved Macquarie Island specimen (F26579) measures 28 mm in length, 16 mm in breadth and 10 mm in height. The best preserved Heard Island specimen (Fig. 2) measures 30 mm in length, 18 mm in breadth, 12 mm in height, with the additional measurements of sole length 25 mm and breadth 11 mm, hypontum breadth 3 mm, rhinophores 6 mm from anterior edge of notum, branchiae 3 mm from posterior edge, and branchial cavity 9 mm in transverse diameter. The largest but severely contracted Heard Island specimen is 48 mm in length and 28 mm in breadth.

Colour slides of the living Macquarie Island specimens, from which Fig. 1 was drawn, show them to

have pale yellow bodies, orange rhinophores and cream gills. Preserved Heard Island specimens are yellowish-orange with orange sole.

The moderately convex notum is covered with large hemispherical papillae, 1 mm diameter, surrounded by small cylindrical papillae generally 0.5 mm diameter and less. There are more large papillae in the median area than marginally. The patterning is less regular in the Heard Island specimens (Fig. 7a) than in those from Macquarie Island (Fig. 7b), with fewer but bigger, small or secondary papillae in the former specimens. Spicules project from some of the smaller papillae. The rhinophoral and branchial cavities have in some specimens small and large papillae along the edges, but in others these cavities are smooth-margined or irregularly formed. The branchial cavity is transversely oval, very shallow and filled by eight bipinnate gills. The gills are best described as contractile rather than retractile, as the cavity is incapable of closure. The fluted anal papilla stands between the rear pair of gills. The rhinophores have 11-14 lamellae. The foot is entire in front (Fig. 3), the head is large and rounded, with indistinctly grooved oral lappets each side.

The labium is thin and smooth. In the larger Macquarie Island specimen, the very pale yellow radula is 4 mm long by 2.5 mm wide with 22 rows of 29.0.29 teeth. The largest Heard Island specimen has a 10 x 6 mm brown radula with 24 rows of 36.0.36 teeth. In the smallest Heard Island specimen, 25 mm in length, the radula is 6.5 x 3.5 mm with 22 rows of 30.0.30 teeth. The teeth in the Macquarie Island specimen (Fig. 5) increase at first slowly (1-7), then sharply (8-13), thereafter decreasing a little (14-27) with short slender marginals. The Heard Island specimens (Fig. 6) show a gradual increase in size in the first 10 teeth, and a sharp decrease in the marginal five or six teeth. All teeth are uniformly hook-shaped.

The anterior genital mass in the largest Heard Island specimen is ovate in shape and measures 22 x 17 mm (Fig. 4). The long fusiform ampulla (b) is white and lies on both anterior and posterior faces of the mass. At the distal end it branches to the wide male (vd) and female (i) ducts. The first part

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of the 35 mm long and 1 mm diameter muscular vas deferens is folded two or three times, thereafter running with a few bends to the dilated penial sheath, into the fundus of which projects the 1 mm long conical penial papilla (p). The vagina, 1 mm in diameter, is short and folded once at its inner end (v); its opening into the genital atrium lies beside the mouth of the penial sheath. The thin-walled spherical spermatheca (st) and curved muscular spermatocyst (sc) are attached vaginally; they lie deeply embedded in the yellow mucous gland (m). The tapering insemination duct (i) is short and folded several times.

In the larger Macquarie Island specimen, the anterior genital mass is flatter and smaller, and the male and female ducts have precisely the same paths except that the spermatocyst lies against the vagina. The penial papilla is 0.3 mm long and wide.

REMARKS: The well-preserved Macquarie Island specimens are distinguished from the storm-tossed Heard Island specimens in several aspects. They are somewhat smaller than all but the smallest strongly contracted Heard Island specimen. The notal papillae are slightly smaller, and more regularly disposed, with clearly defined rings of secondary papillae around the primary papillae. The dimensions of the radula are considerably smaller than in the smallest Heard Island specimen, yet the numbers of rows and teeth per row are almost identical. The gradation of the teeth per radular half-row differs, with more teeth of the same size in the Heard Island specimens. More material from both localities would reduce any significance in these differences, and they are here regarded as intra-specific variants of one species.

The original specimen of *A. kerguelenensis* Bergh 1884 was dredged from 25 fathoms off Royal Sound, Kerguelen Islands. It measured 45 mm in length, 18 mm in breadth and 12 mm in height, and was yellowish in colour with varying-sized papillae all over the notum and small papillae along the rims of the rhinophoral and branchial openings. The rhinophores had 30-40 lamellae; there were seven gills. The labium was soft and smooth, the radula had 27 rows of at most 40.0.40 teeth. The globular spermatheca and curved spermatocyst were attached close together to the top of vagina and insemination duct, the vas deferens was long, thick, non-prostatic, and terminated in a small conical penial papilla.

The Macquarie and Heard Island specimens appear to have larger notal papillae than Bergh specifies in his description, and at most half the number of rhinophoral lamellae. According to Mrs. Eveline Marcus (pers. comm.), Bergh sometimes counted the lamellae on both sides of the rhinophoral clavus, thus 15-20 is probably the correct count in the Kerguelen type and much closer to the count of 11-14 in the present specimens. The present radulae have fewer rows and fewer teeth per row, even though the largest Heard Island specimen is larger than the Kerguelen type. The attachment of the spermatheca and spermatocyst is vaginal in specimens from both islands, whereas Bergh with only one specimen at his disposal described the spermatocyst as attached to the base

of the insemination duct. Again, these differences appear to be intra-specific, thus insufficient to preclude identifying the Macquarie and Heard Island specimens with *Archidoris kerguelenensis* Bergh from the Kerguelen Islands.

The relationship of the molluscan faunas of Macquarie and Heard Islands to each other and to that of the Kerguelen Islands has been discussed by Powell (1955, 1960) and Dell (1964). Both authors emphasize the strong endemism of the faunas and their link with the fauna of the Kerguelen Islands. Therefore, it is not surprising that *A. kerguelenensis* occurs at all three places.

Archidoris Bergh 1878 is a genus of large to medium sized species. Besides *A. kerguelenensis* described above, the following species were examined in the course of this research; the type species *A. tuberculata* (Cuvier 1804) from Salcombe, England, *A. montereyensis* (Cooper 1862) and *A. odhneri* (MacFarland 1966) from Friday Harbour, Washington, U.S.A., *A. wellingtonensis* (Abraham 1877) from New Zealand and Australia, and a new species from Sydney, New South Wales. Of these five species, *A. tuberculata*, *A. montereyensis* and the new species have notal ornamentation (Fig. 7c-e) similar to that of *A. kerguelenensis* (Fig. 7a-b), namely large papillae set in a field of small papillae. Characteristics which separate these species from *A. kerguelenensis* are: in *A. tuberculata*, an exceptionally long winding vas deferens and long tapering penial papilla; in *A. montereyensis*, a long winding vas deferens and long penial papilla; in the new Australian species, a shorter radula, shorter vas deferens and smaller penial papilla.

The other two species have a very different notal ornamentation from the species of the *A. tuberculata* group. Large and small irregular but low papillae occur in *A. odhneri* (Fig. 7f), and large regular hemispherical papillae in *A. wellingtonensis* (Fig. 7g). The male ducts too are very different, with a broad variable penial papilla, and a large sheath of fibrous tissue through which passes the outer part of the vas deferens. From its description and figure, the South African *A. scripta* Bergh 1907 belongs to this group, even though the notum is described as smooth.

Species of the antarctic genus *Austrodoris* Odhner 1926 are very similar to *A. kerguelenensis* and the new Australian species in the length of the vas deferens and absence of a prostatic section. However, *Austrodoris* has a tough leathery sheath enclosing the vas deferens for its whole length and is devoid of a penial papilla.

The following list gives reputed species of *Archidoris*, for which details of the genital organs have not been described:

- africana* Eliot 1903, East Africa
- australis* Bergh 1884, Kerguelen Islands
- capensis* Bergh 1907, South Africa
- fulva* Eliot 1907, Australia
- granosa* Bergh 1907, South Africa
- kurana* Bergh 1905, Indonesia
- minor* Eliot 1903, East Africa
- nanula* Bergh 1904, New Zealand
- violacea* Bergh 1904, New Zealand

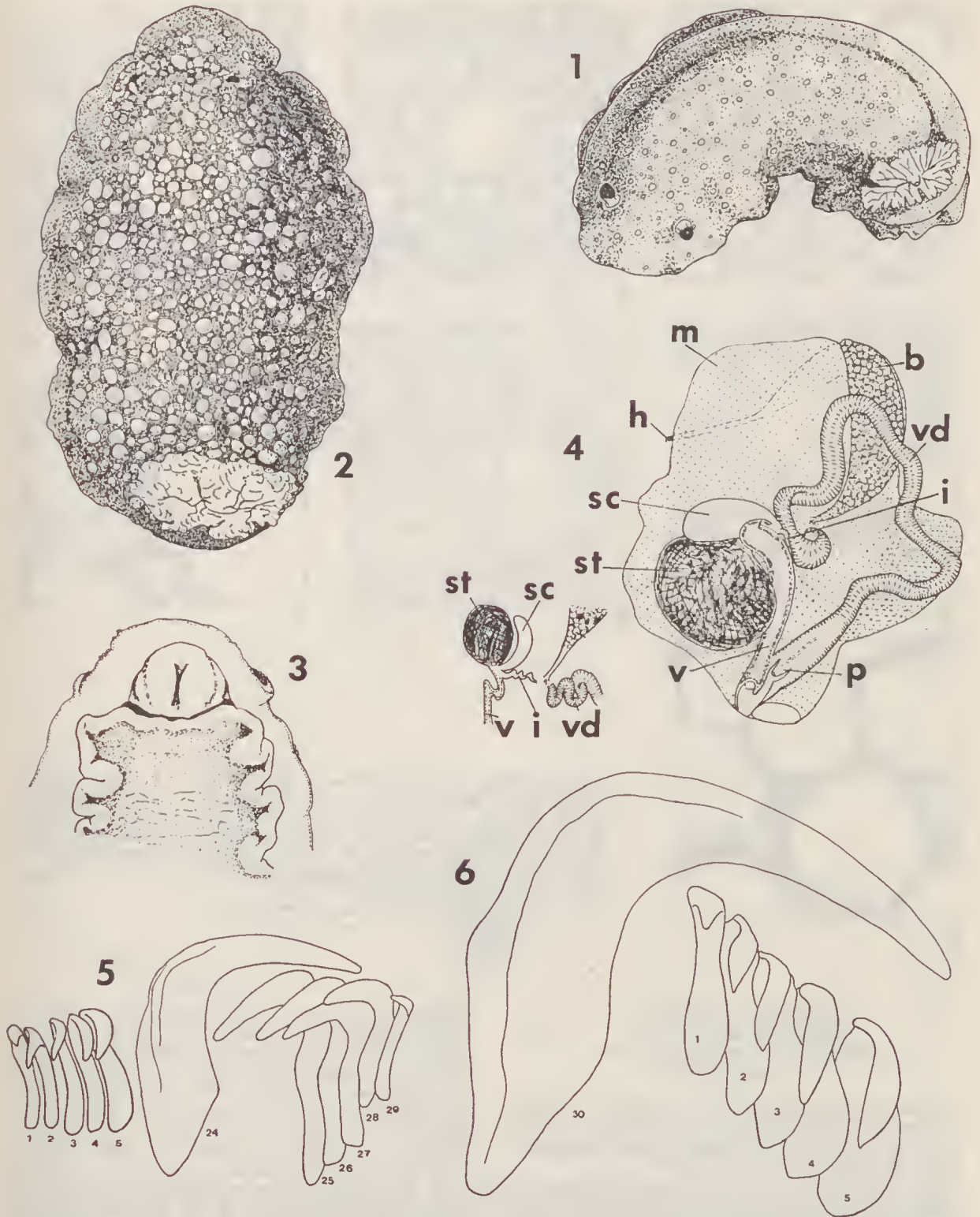


FIG. 1-6—*Archidoris kerguelensis* Bergh. 1—Larger Macquarie Island specimen, drawn from a colour slide. 2—Heard Island specimen, length 30 mm. 3—Ventral aspect of anterior of Heard Island specimen. 4—Reproductive organs. 5—Radular teeth from Macquarie Island specimen. 6—Radular teeth from Heard Island specimen. Abbreviations: b—ampulla, h—hermaphrodite duct, i—insemination duct, m—mucous gland, p—penial papilla, sc—spermatocyst, sp—spermatheca, v—vagina, vd—vas deferens.

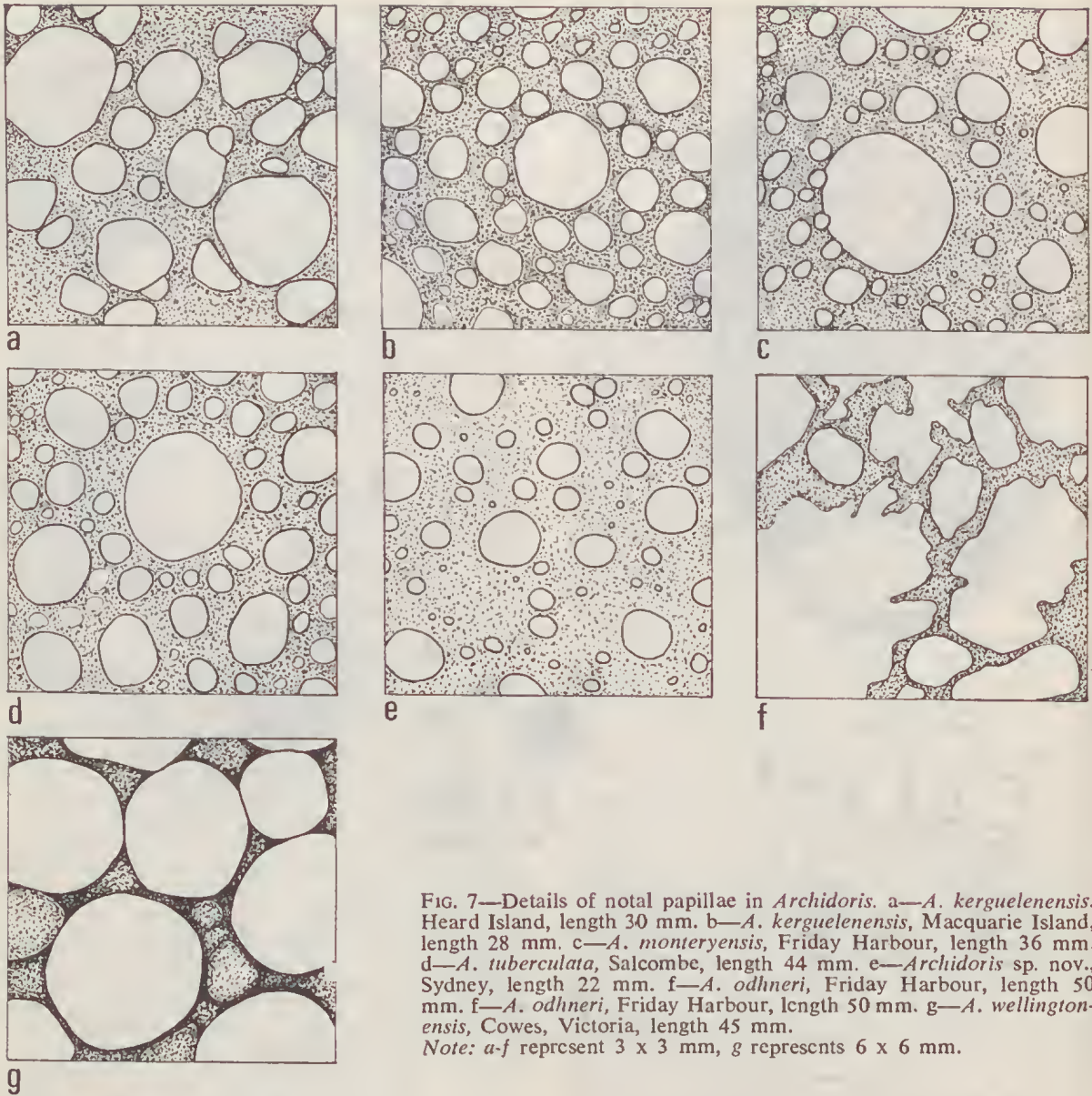


FIG. 7.—Details of notal papillae in *Archidoris*. a—*A. kerguelenensis*, Heard Island, length 30 mm. b—*A. kerguelenensis*, Macquarie Island, length 28 mm. c—*A. monterysensis*, Friday Harbour, length 36 mm. d—*A. tuberculata*, Salcombe, length 44 mm. e—*Archidoris* sp. nov., Sydney, length 22 mm. f—*A. odhneri*, Friday Harbour, length 50 mm. g—*A. odhneri*, Friday Harbour, length 50 mm. f—*A. odhneri*, Friday Harbour, length 50 mm. g—*A. wellingtonensis*, Cowes, Victoria, length 45 mm.

Note: a-f represent 3 x 3 mm, g represents 6 x 6 mm.

Family CUTHONIDAE
Trinchesia Ihering 1879
Trinchesia macquariensis sp. nov.
 (Fig. 8-12)

MATERIAL: Holotype, NMV F27406, from red alga *Plocamium hookeri* Harvey, 60 m offshore at 5 m depth in Buckles Bay, Macquarie Island, collected by R. D. Simpson, 19 December 1968.

Paratype, NMV F27407, from small algae and encrusting corallines in rock pool at Garden Cove, Buckles Bay, Macquarie Island, collected by Isobel Bennett, 23 March 1968.

DESCRIPTION: Alive, the holotype was 5 mm in length and pink in colour; preserved it is nearly 4 mm long with rhinophores 1.6 mm long and cerata up to 2 mm long, and the colour is uniformly white. The preserved paratype is white, 5 mm long with rhinophores 1.7 mm and cerata up to 2.25 mm in length. The slender body is widest at the head and highest at the level of the anus in the cardiac region. The slender fusiform cerata stand in three rows of 1, 3, 3 in the anterior liver and five rows of 3, 2, 2, 2, 1 in the posterior liver of the holotype (Fig. 8); the paratype has four rows of 2, 3, 4, 5 cerata in the anterior liver and five rows of 3, 3, 2, 2, 1 cerata

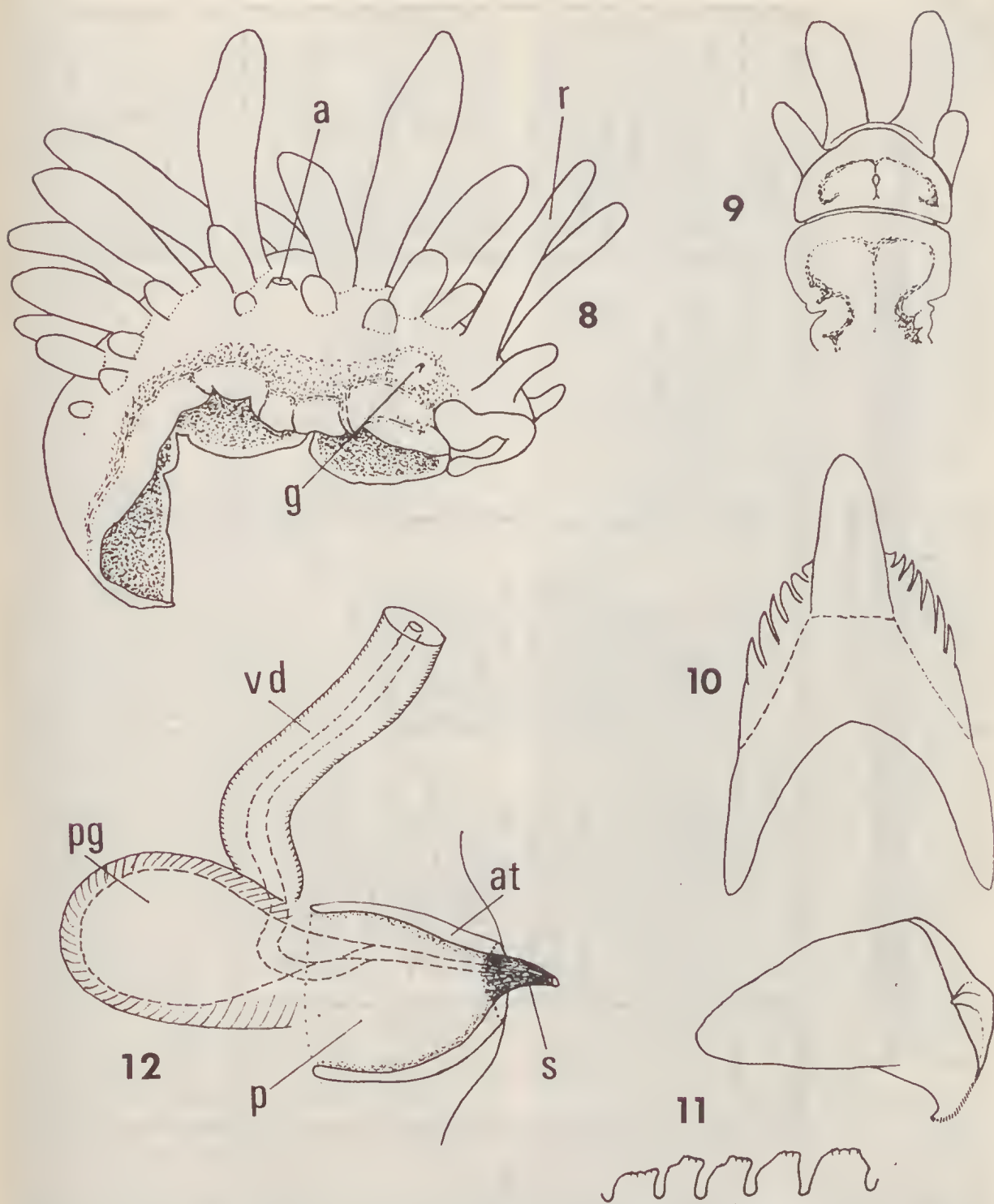


FIG. 8—12—*Trinchesia macquariensis* sp. nov. 8—Preserved holotype from right side. 9—Ventral aspect of head of holotype. 10—Radular tooth. 11—Jaw and details of masticatory border. 12—Male copulatory organs. Abbreviations: a—anus, at—atrium, g—genital aperture, p—penis, pg—penial gland, r—rhinophores, s—stylet, vd—vas deferens.

TABLE 1
A CLASSIFICATION OF THE SPECIES ATTRIBUTED TO *TRINCHESIA* BASED ON CHARACTERISTICS OF THE MALE REPRODUCTIVE SYSTEM (AFTER EDMUNDS & KRESS 1970).

Prostatic vas deferens

	Present	Absent	Not Known
	<p><i>abronia</i> MacFarland 1966 <i>albocrusta</i> MacFarland 1966 <i>allopunctata</i> Schmeke1 1968 <i>beta</i> Baba & Abe 1964 <i>bona</i> Edmunds 1970 <i>coerulea</i> Montagu 1804 <i>flavovulva</i> MacFarland 1966 <i>fulgens</i> MacFarland 1966 <i>granosa</i> Schmeke1 1966 <i>ilonae</i> Schmeke1 1968 <i>kanga</i> Edmunds 1970 <i>miniostricata</i> Schmeke1 1968 <i>momella</i> Edmunds 1970</p>	<p><i>lagunae</i> O'Donoghue 1926 <i>macquariensis</i> Burn sp nov. <i>virens</i> MacFarland 1966</p>	<p><i>ameona</i> Alder & Hancock 1845 <i>annandalei</i> Elliot 1910 <i>catachroma</i> Burn 1963 <i>foliata</i> Forbes & Goodsir 1839 <i>lonca</i> Marcus 1965 <i>pinnifera</i> Baba 1949 <i>susa</i> Marcus & Marcus 1960 <i>valentini</i> Elliot 1907 <i>viridiana</i> Burn 1962</p>
Present	<p><i>ocellata</i> Schmeke1 1966 <i>ornata</i> Baba 1937 <i>pallida</i> Baba 1949 <i>perca</i> Marcus 1958 <i>pupillae</i> Baba 1961 <i>purpurcoanulata</i> Baba 1961 <i>rubrata</i> Edmunds 1970 <i>signifera</i> Baba 1961 <i>speciosa</i> Macnae 1954 <i>taita</i> Edmunds 1970 <i>thelmae</i> Burn 1964 <i>tina</i> Marcus 1957 <i>viridis</i> Forbes 1840</p>		
Absent	<p><i>futairo</i> Baba 1963 <i>georgiana</i> Pfeffer 1884 <i>odhneri</i> Marcus 1959 <i>schraederi</i> Pfeffer 1884</p>	<p><i>concinna</i> Alder & Hancock 1843 <i>pustulata</i> Alder & Hancock 1854 <i>suecica</i> Odhner 1940</p>	<p><i>colmani</i> Burn 1961 <i>distans</i> Odhner 1922 <i>netica</i> Marcus & Marcus 1960 <i>pusillia</i> Bergh 1898 <i>zealandica</i> Odhner 1924</p>
Not Known			<p><i>anulata</i> Baba 1949 <i>henrici</i> Elliot 1916 <i>nigricolora</i> Baba 1955 <i>puellula</i> Baba 1955 <i>pumilio</i> Bergh 1871 <i>venusta</i> Baba 1949</p>

Penial
stylet

in the posterior liver. The genital aperture opens below the first, or first and second rows of the right anterior liver, the anus stands before the space between the two larger cerata of the first row of the right posterior liver. The anterior foot corners (Fig. 9) are rounded, the tentacles and rhinophores are slender and smooth, and the mouth is deeply recessed.

The yellowish jaws are 1.1 mm long in the paratype, clongate in shape with 31 coarse denticles on the border (Fig. 11). The radula comprises 20 hyaline teeth up to 0.2 mm long in a single series, with prominent cusp and six or seven smaller lateral denticles each side (Fig. 10).

A colourless tubular stylet projects from the genital aperture of the holotype. In the paratype (Fig. 12), the 0.4 mm long by 0.26 mm diameter penis (p) bears a hollow cuticular stylet (s) 0.14 mm long at its tip; the penial gland (pg) which opens into the penis is 0.35 mm long and 0.24 mm in diameter; and the thick vas deferens (vd) has no prostatic section.

REMARKS: The presence of a cuticular penial stylet distinguishes *T. macquariensis* from all Antarctic and Sub-Antarctic cuthonid species described to date, with the exception of *T. valentini* (Eliot 1907) from the Falkland Islands. However, *T. valentini* is a larger species, 10 mm long preserved, with fewer cerata in rows of not more than two, a less prominent radular cusp and 7-9 more prominent lateral denticles, and in life a brownish body and cerata.

Geographically close species of *Trinchesia* from southern temperate waters of New Zealand, Australia and South Africa all differ from *T. macquariensis* in colour pattern, jaw and radular details, and in various aspects of the genital system (Morton & Miller 1968, Burn 1962, 1963, 1964, Macnae 1954).

The other species listed in Table 1 with penial stylet present, prostatic vas deferens absent are separated from *T. macquariensis* by colour and radular shape. *T. lagunae* (O'Donoghue 1926) (= *T. rutila* (MacFarland 1966)) has an orange-coloured V-shape on the head, orange-coloured rhinophores and ceratal tips, and brown digestive glands, plus a radular cusp not longer than the lateral denticles. *T. virens* (MacFarland 1966) has yellow ceratal tips and light green digestive glands, and the radular cusp not longer than the lateral denticles.

Edmunds (1964, 1968, 1969, 1970) and Edmunds and Kress (1970) have clearly demonstrated that the presence or absence of a penial stylet is of specific, rather than generic value in the Eolidacea. Application of this principle to the family Cuthonidae, where there is small morphological variation (Miller 1971), necessitates abandonment of the subfamilies Cuthoninae (without stylet) and Tergipedinae (with stylet) earlier proposed by the writer (Burn 1963, 1964).

This principle also allows the transfer to *Trinchesia* of those species previously assigned to *Cuthona* which have a penial gland, a condition contrary to that found in the type species of the latter genus, *C. nana* (Alder & Hancock 1842), (Odhner 1939, 1944). Table 1 lists, according to the available knowledge

of their reproductive systems, all the species that the writer regards as belonging to *Trinchesia*. It includes the '*Cuthona*' species with penial gland, plus the type species of the monotypic genera *Xenocratena* Odhner 1940, *Subcuthona* Baba 1949, *Narraeolida* Burn 1961, *Toorna* Burn 1964, and *Njurja* Marcus & Marcus (1960a), none of which can be maintained in an expanded genus that allows a shorter or longer radular cusp and armed or unarmed penis.

One might also ponder whether or not *Tenellia* Costa 1866, whose type species *T. adspersa* (Nordmann 1845) (= *T. pallida* (Alder & Hancock 1855)) (Marcus & Marcus 1955, 1960b) has a velum in place of cephalic tentacles, can be retained as a genus separate from *Trinchesia*, in view of their otherwise close similarity. The occurrence of a second species *T. fuscata* (Gould 1870), undoubtedly congeneric with the type of *Tenellia* but specifically distinct from it, suggests that this genus should be retained at least with subgeneric status. Also, *Tergipes* Cuvier 1805, in which the right liver is reduced to one branch with one ceras, is morphologically very similar to *Trinchesia*. They are probably congeneric, and if this is proved, *Tergipes* will have priority.

Three cuthonid genera with a penial gland and simple branches of the liver are distinct from the *Trinchesia*/*Tenellia*/*Tergipes* group. In *Catriona* Winckworth 1941 the pre-radula is retained, the radular teeth distinctively formed with minute accessory denticles between the larger denticles, and the masticatory borders of the jaws composed of bundles of bristles. In *Selva* Edmunds 1964 the anus is in the cleioproctic position. In *Phestilla* Bergh 1874 the cephalic tentacles are greatly reduced, the cerata stand upon raised flanges, and there are no cnidosacs. A penial gland attached to the base of the penis, non-prostatic vas deferens and unarmed penis are other characteristics of *Phestilla melanobranchia* Bergh 1874, the type of the genus (pers. obs.).

Genera with laterally multiplying branches of the liver are *Cuthonella* Bergh 1884, *Guyvalvoria* Vaysière 1906 and *Precuthona* Odhner 1929. The first two have the anus opening on the dorsal or median side of the cerata, *Cuthonella* with a slender penial gland attached by a narrow duct to the mid-length of the non-prostatic vas deferens, *Guyvalvoria* with the penial gland attached to the base of the penis and a prostatic vas deferens. In *Precuthona*, the anus is somewhat cleioproctic in that it occurs within the foremost liver branch of the posterior liver, the penial gland opens into the penis and the vas deferens is prostatic. These genera are very closely related to the *Trinchesia*/*Tenellia*/*Tergipes* group.

Genera without a penial gland are *Cuthona* Alder & Hancock 1855 and *Embletonia* Alder & Hancock 1851. Besides the type species *C. nana* (Alder & Hancock 1842), *Trinchesia sororum* Burn 1964 and *Catriona urquiza* Marcus 1965, both without penial gland, belong to *Cuthona*. *Embletoniella* Baba 1967 which has four apical twigs or nodes to each ceras, no cnidosacs, and a prostatic unarmed penis should be reduced to either a synonym or at most a subgenus of *Embletonia*.

The penial gland is not described for the genera *Indocratena* Odhner 1940, *Cratenopsis* Lemche 1935, *Ennoia* Bergh 1896, *Myja* Bergh 1896 and *Zatteria* Eliot 1902, all classified as Cuthonidae by their authors.

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